Technical Datasheet #TDAXDIO128

Discrete I/O
P/N: AXDIO128
12 inputs, 8 relay outputs, SAE J1939
with Electronic Assistant®

Description: The Discrete I/O Module reads 12 discrete inputs and sets 8 Form C relay outputs while networking with other CAN devices (SAE J1939) in a machine control system. The unit is a battery powered device with the ability to withstand engine cranking, reverse polarity and transient power conditions. In engine applications, information is provided to the engine control system using single-frame J1939 application-specific PDU2 type messages. Outputs can be controlled by any input or CAN message. A bi-color LED indicates operational status.

The AXDIO128 has a number of setpoints that allow the user to configure it for their application. The *Windows*-based Electronic Assistant® can be used to configure the module over the CAN line. The setpoints can also be saved to a file and flashed into other AXDIO128 modules over the CAN bus. Alternatively, a RS-232 interface allows for quick user configuration adjustments using Windows HyperTerminal or other similar terminal software. Settings are saved to non-volatile memory upon command. A CANopen® model is available.

The AXDIO128 features rugged packaging and watertight Deutsch IPD connectors for an IP65 rating. The module is UL recognized for UL508 (FTPM2) – Controls for Stationary Engine Driven Assemblies and has a cUL recognition as well. The control carries a CE mark for the EMC and RoHS Directives. The DIO Module meets the environmental, EMC and vibration requirements of generator set applications in marine installations and has type approvals from several marine societies (LR, DNV, ABS, etc.).

Applications: Power Generator Sets, Diesel Engine Control Systems

Ordering Part Numbers:

SAE J1939 Discrete I/O Controller: **AXDIO128**
A CANopen® model is available as P/N AXDIO128CO.

Electronic Assistant® P/N: **AX070502**
The configuration kit includes the following.
USB-CAN Converter P/N: AX070501
1 ft. (0.3 m) USB Cable P/N: CBL-USB-AB-MM-1.5
12 in. (30 cm) CAN Cable with female DB-9 P/N: CAB-AX070501
AX070502IN CD P/N: CD-AX070502, includes: Electronic Assistant® software; EA & USB-CAN User Manual UMAX07050X; USB-CAN drivers & documentation; CAN Assistant (Scope and Visual) software & documentation; and the SDK Software Development Kit.

Mating Plug Kit P/N: **AX070200**
This kit includes the following items. These items are also available from a local Deutsch IPD distributor.
NB. The sealing plugs are only needed in cases where less than the 40 pins are required.

Deutsch IPD P/N:	*Description:*
0462-201-16141	48 16AWG SOCKETS SOLID 16-20AWG WIRE 6mm
114017	24 SEALING PLUGS SIZE 12-16 CAVITIES 12-18 AWG
DRC16-40S	40-PIN PLUG, No Key
DT06-08SA	DT SERIES PLUG 8 CONTACT
W8S	WEDGELOCK FOR DT 8 PIN PLUG

A crimping tool from Deutsch IPD is required to connect wiring to the sockets, P/N: HDT 48-00 or equivalent (not supplied).

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5915 Wallace Street
Mississauga, ON Canada L4Z 1Z8
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Fax. 1 905 602 9279
www.axiomatic.com

Technical Specifications

- Modules are designed for mounting on power generator sets or remotely up to 30 ft.
- Multiple AXDIO128 modules can be used on a CAN network.

Inputs

Power Supply Input	12V or 24VDC nominal (9…32 VDC power supply range)
Supply Current	At 12V: 90 mA + 50mA per active relay, typical At 24V: 50 mA + 30mA per active relay, typical
Protection	Reverse polarity protection is provided. Power supply input section protects against transient surges and short circuits and is galvanically isolated from digital inputs and earth ground.
Inputs	Reads twelve (12) discrete inputs (active low with pull-up resistors) Input level characteristics: Low-Level input voltage: 0 to 0.8 V High-Level input voltage: 3.75 to +BAT Inputs have internal pull-up resistors. Input resistance: more than 5 kOhms The inputs have internal over and under voltage protection.
Digital GNDs	Four digital GND pins are provided.
PGNs	AXDIO128 is an Arbitrary Address Capable ECU. It can dynamically change its network address in real time. The AXDIO128 supports: Address Claimed Messages (PGN 60928); Requests for Address Claimed Messages (PGN 59904); and Commanded Address Messages (PGN 65240). AXDIO128 supports Transport Protocol for Commanded Address messages (PGN 65240). It also supports responses on PGN Requests (PGN 59904). It transmits Software ID PGN65242 (-SOFT) only on request. AXDIO128 can constantly transmit the state of digital inputs in a user defined PDU2 PGN, set to proprietary B PGN 65440 by default. AXDIO128 can receive user defined PDU2 PGN controlling output relays, set to 65448 by default. AXDIO128 can receive mode select commands or send mode status feedback in a user defined PDU2 PGN, set to proprietary B PGN 65456 by default. There are two types of predefined structures for the data in the messages that are sent/received by the AXDIO128 for the I/O channels. With “compact” data, the structure is similar to PGN65241 (-AUXIO) where each channel has two bits per byte, resulting in up to four channels being read/controlled by one byte of data. However, if “expanded” data is used, each I/O channel is read/controlled by an individual byte in a message. The PGNs that are used for “Input State”, “Relay Control” or “Mode Select” messages used/recognized by the AXDIO128 are individually configurable by the user.

Outputs

Outputs	Sets 8 Form C relay outputs. Resistive load: • 2A NO)/2 A (NC) at 277 VAC • 2 A (NO)/2 A (NC) at 125 VAC • 2 A (NO)/2 A (NC) at 30 VDC Dielectric strength: • 4,000 VAC, 50/60 Hz for 1 min between coil and contacts • 750 VAC, 50/60 Hz for 1 min between contacts of same polarity There is no special overcurrent/overvoltage protection on the relay outputs. The user is advised to provide a fast acting 3A fuse or an adequate external protection if necessary.

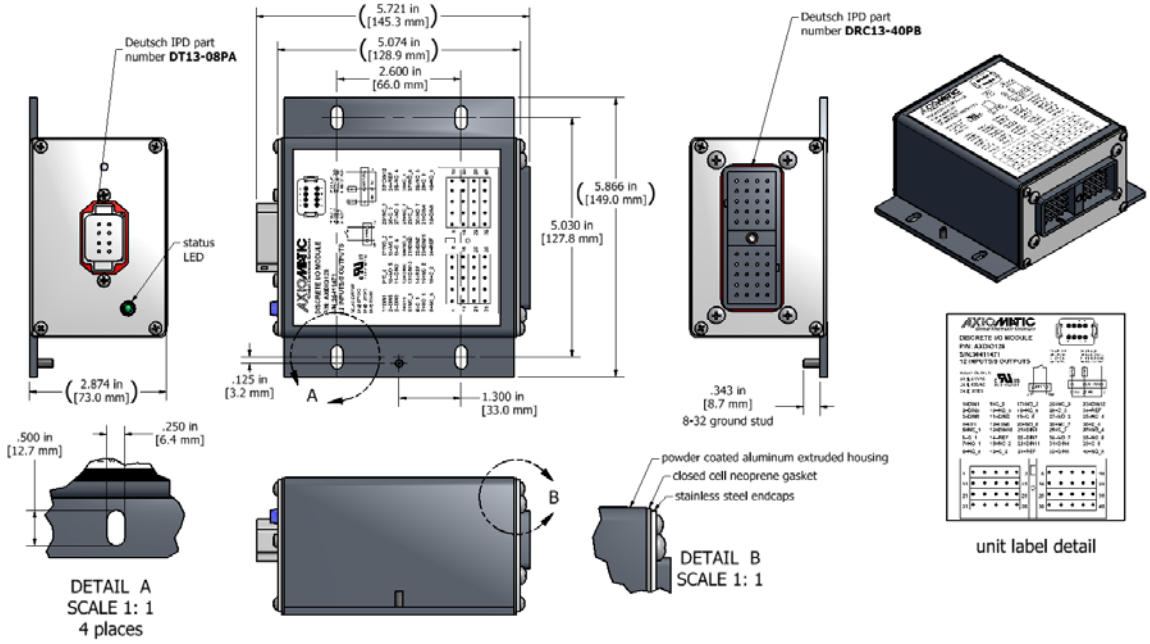
Communication

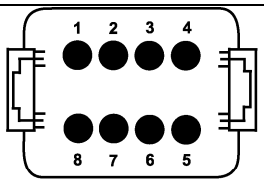
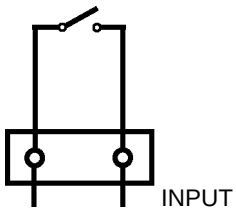
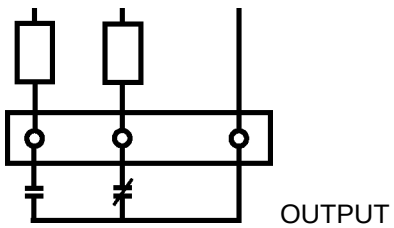
CAN	1 CAN 2.0B port, protocol SAE J1939 Baud Rate: 250 bit/sec. Digital isolation is provided for the CAN line. *A CANopen® model, P/N: AXDIO128CO, is available.* Other features of the CAN communications interface include: • It has two configurable "slew rates" to accommodate different CAN (SAE J1939) connections (and is capable of working both on the standard J1939 link between an engine controller and a generator controller, as well as on a J1939 accessory module link from a generator controller in power generation applications). • Node address is auto configurable as per J1939-81 or per customer request. • A watchdog timer to require a reboot when the microprocessor locks • The AXDIO128 is designed to remain powered during engine cranking.
Network Termination	According to the CAN standard, it is necessary to terminate the network with external termination resistors. The resistors are 120 Ohm, 0.25W minimum, metal film or similar type. They should be placed between CAN_H and CAN_L terminals at both ends of the network.
RS-232	1 RS-232 port is available for debugging purposes. ASCII Text Format, 115200 Baud Rate Data – 8 bit, Parity – None, Stop – 1 bit. Flow Control – Xon/Xoff. Short circuit protection to ground.

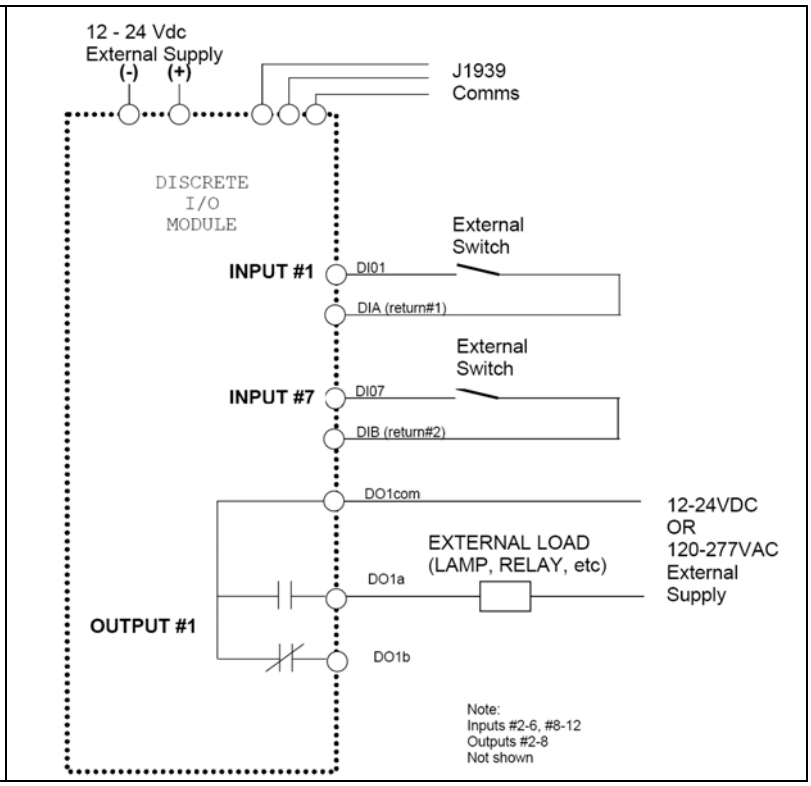
General Specifications

Microprocessor	ADUC843
Isolation	The power supply is galvanically isolated from digital inputs and earth ground.
Indicator	LED indicator remains RED when a network error occurs. It flashes green when the module is able to send messages over the bus but there is no network activity detected by the module. It stays ON and is GREEN when it is operating normally and is powered.
SAE J1939 Profile	For J1939 compliance (SAE, Recommended Practice for a Serial Control and Communications Vehicle Network, October 2007) all modules comply with the applicable portions of the following: SAE J1939-11, 15 – Physical Layer, Reduced Physical Layer SAE J1939-21, December 2006, Data Link Layer SAE J1939-71, January 2009, Vehicle Application Layer SAE J1939-73, September 2006, Application Layer – Diagnostics SAE J1939-81, May 2003, Network Management *Customer specific proprietary extensions can also be included in the SAE J1939 profile on request.*
User Interface	Electronic Assistant®, P/N: AX070502 Updates for the EA are found on www.axiomatic.com under the log-in tab.

<table>
<tr><td>Control Logic</td><td>The AXDIO128 is designed to work either as a stand-alone module, or on J1939 CAN network. When connected to the network, it automatically recognizes network connection, claims a network address and can be configured to perform the following application tasks.
Converts between physical I/O and CAN (SAE J1939) single frame commands
Continuously broadcast the current state of digital inputs using a proprietary InputPGN
Receive and process OutputPGNs to control DIO output relays
The AXDIO128 can operate in one of four different modes: Normal Mode (CAN); Discrete Mode; Fault Mode; or Disabled Mode. Refer to the user manual for details.
In Normal Mode, there are four ways the output can be configured to respond to the state of the control input (discrete input or CAN message): disabled; normal ON/OFF; inverted ON/OFF; or latched (changes state every time the control input transitions from OFF to ON). In Normal Mode, each output has four setpoints associated with it that determine the control input, control response, enable input and enable response for that relay.
In Discrete Mode the relays can only be controlled be a discrete input wired to the module (no CAN). In Discrete Mode, there are an additional 2 setpoints for Control Input and Enable Input.
In Fault Mode, the relay is driven to a particular state.
In Disabled Mode, all output relays are de-energized.
AXDIO128 uses Memory Access Protocol (MAP) for setpoint programming from the Electronic Assistant®.</td></tr>
<tr><td>UL and cUL Compliance</td><td>UL508 (April 2010) (FTPM2) – Controls for Stationary Engine Driven Assemblies
cUL C22.2 No. 14-10 (2010)</td></tr>
<tr><td>CE Compliance</td><td>2004/108/EC (EMC Directive)
2011/65/EU (RoHS Directive)</td></tr>
<tr><td>Vibration</td><td>4.3 G for off-engine mounting
The marine type approval process tested to 4.0 G per IEC 60068-2-6, Test Fc.</td></tr>
<tr><td>Marine Type Approval</td><td>Lloyd’s Register, DNV, ABS, RINA, GL, BV, CCS, IRS, RS
The AXDIO128 meets the environmental, EMC and vibration requirements of generator set applications in marine installations.</td></tr>
<tr><td>Operating Temperature Range</td><td>-40 to 85 ºC (-40 to 185 ºF)</td></tr>
<tr><td>Storage Temperature Range</td><td>-50 to 120 ºC (-58 to 248 ºF)</td></tr>
<tr><td>Humidity</td><td>Protected against 95% humidity non-condensing, 30 ºC to 60 ºC</td></tr>
<tr><td>Protection</td><td>IP67
Pollution Degree 3 rating per UL508
The marine type approval process tested to IP56.</td></tr>
<tr><td>Weight</td><td>2.73 lbs. (1.24 kg)</td></tr>
<tr><td>Enclosure</td><td>Rugged aluminum housing, stainless steel end plates, neoprene gaskets
145.30 x 149.00 x 73.00 mm (5.72 x 5.86 x 2.87”) L x W x H
Connectors, Deutsch IPD P/N: 1 8-pin DT13-08PA, 1 40-pin DRC13-40PB</td></tr>
<tr><td>Mating Sockets</td><td>Use the following Deutsch IPD mating plugs to connect to the integral receptacles. Wiring to these mating plugs must be in accordance with all applicable local codes. Suitable field wiring for the rated voltage and current must be used. The rating of the connecting cables must be at least 70°C. Use field wiring suitable for both minimum and maximum ambient temperature.
<table>
<tr><td>Receptacle</td><td>Mating Socket (Refer to www.laddinc.com for more information on the wedgelock and contacts for this mating plug.)</td></tr>
<tr><td>Power and CAN bus: DT13-08PA</td><td>DT06-08SA with wedgelock W8S</td></tr>
<tr><td>I/O Interface Receptacle: DRC13-40PB</td><td>DRC16-40SE-B
DRC18-40SB
DRC16-40S
with sockets 0462-201-16141</td></tr>
</table>
Axiomatic offers a mating connector plug kit, P/N AX070200, that includes the 8 pin and 40 pin (unkeyed) plugs and sockets.</td></tr>
</table>

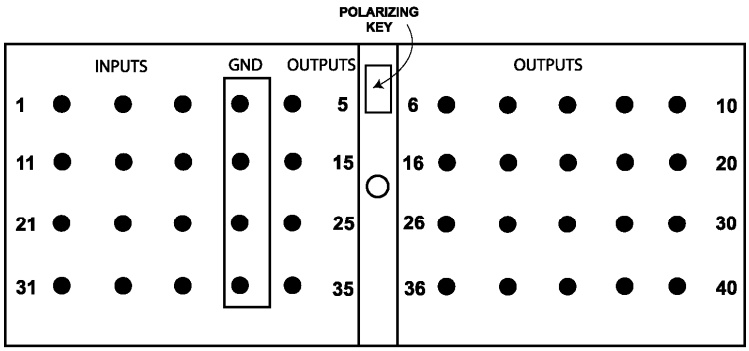

Deutsch IPD part number DT13-08PA
status LED
2.874 in [73.0 mm]
5.721 in [145.3 mm]
5.074 in [128.9 mm]
2.600 in [66.0 mm]
5.866 in [149.0 mm]
5.030 in [127.8 mm]
.125 in [3.2 mm]
A
1.300 in [33.0 mm]
Deutsch IPD part number DRC13-40PB
.343 in [8.7 mm] 8-32 ground stud
.500 in [12.7 mm]
.250 in [6.4 mm]
DETAIL A SCALE 1: 1 4 places
B
powder coated aluminum extruded housing
closed cell neoprene gasket
stainless steel endcaps
DETAIL B SCALE 1: 1
unit label detail

Electrical Pin Out – Power and CAN	 **FRONT VIEW** **MODULE MOUNTED CONNECTOR** **DEUTSCH P/N: DT13-08PA** **1 = PWR+ 5 = SHIELD** **2 = CAN-H 6 = RS-232 GND** **3 = CAN-L 7 = RS-232 TXD** **4 = PWR- 8 = RS-232 RXD** (Mating plug is DT06-08SA with wedgelock W8S and sockets 0462-201-16141.)
Electrical Wiring – I/O	 

DIO Wiring - Typical	

Electrical Pin Out – 40 Pin Connector

FRONT VIEW OF
MODULE MOUNTED CONNECTOR
DEUTSCH P/N: DRC13-40PB



NO - Normally Open
NC - Normally Closed
C - Common

INPUTS	Pin	OUTPUTS	Pin
DIN1	1	NC_1	5
DIN2	11	C_1	6
DIN3	21	NO_1	7
DIN4	31	NC_2	15
DIN5	2	C_2	16
DIN6	12	NO_2	17
DIN7	22	NC_3	25
DIN8	32	C_3	26
DIN9	3	NO_3	27
DIN10	13	NC_4	35
DIN11	23	C_4	36
DIN12	33	NO_4	37
GND	4	NC_5	8
GND	14	C_5	9
GND	24	NO_5	10
GND	34	NC_6	18
		C_6	19
		NO_6	20
		NC_7	28
		C_7	29
		NO_7	30
		NC_8	38
		C_8	39
		NO_8	40

Mating Connector Part Number: Deutsch IPD p/n DRC16-40SE-B or DRC18-40SB or DRC16-40S with sockets 0462-201-16141

Note: CANopen® is a registered community trade mark of CAN in Automation e.V.

Specifications are indicative and subject to change. Actual performance will vary depending on the application and operating conditions. Users should satisfy themselves that the product is suitable for use in the intended application. All our products carry a limited warranty against defects in material and workmanship. Please refer to our Warranty, Application Approvals/Limitations and Return Materials Process as described on www.axiomatic.com/service.html.

TDAXDIO128-10/22/15